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## Thunderslide - from rainfall to preliminary landslide mapping: implementing an open data-oriented framework for landscape management authorities

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Gathering systematic information on the effects of extreme weather events (e.g., flooded areas, shallow landslide and debris flow activations, windthrows) is a fundamental prerequisite for local authorities to put into practice management strategies and establishing early-intervention priorities. The collection of these data is a resource-demanding task requiring huge personnel effort and financial means. Furthermore, events occurring in remote areas with a low chance of intersecting human infrastructure, are rarely detected and mapped accurately, thus leading to incorrect assumptions in relation to both extreme events spatial distribution and especially to the real occurrence probability. The present work aims at tackling some of the above-mentioned issues by providing a framework for obtaining the automatic identification of severe weather events that may have caused important erosional processes or vegetation damage, combined with a quick and preliminary change detection mapping over the identified areas.

The proposed approach leverages the free availability of both high-resolution global scale radar rainfall products and Sentinel-2 multispectral images to identify the areas to be analyzed and to carry out change detection algorithms, respectively. Radar rainfall data are analyzed and areas where high intensity rainfall and/or very important cumulative precipitation has occurred are used as a mask for restricting the subsequent analysis, which, in turn, is based on a multispectral change detection algorithm.

The testing phase of the proposed methodology provided encouraging results: applications to selected mountain catchments hit by the VAIA storm in northeastern Italy (October 2018) were capable of identifying flooded areas, debris-flow and shallow landslide activations and windthrows with good accuracy and with the ability to distinguish between erosional processes and windthrows.

The described approach can serve as a preliminary step toward detailed post-event surveys, but also as a preliminary *"quick and dirty"* mapping framework for local authorities especially when resources for ad hoc field surveys are not available.

Such a systematic potential change identification, in combination with regular expert-driven validation, can finally pave the way for a process of self-improvement in detection and classification accuracy: if classified changes are validated, machine-learning algorithms can be

trained to learn and improve performance not only in change detection accuracy but also in single-scene classification.

Future improvements of the described procedure could be finally devised for allowing a continuous operational activity and for maintaining an open-source software implementation.